

What Is Claimed Is:

1. A method for reducing sensed physical variables comprising:
 - a) sensing a plurality of physical variables;
 - b) generating a first sensed signal as a function of the sensed physical variables;
 - c) generating a first control command signal as a function of the first sensed signal;
 - d) constraining a k_{th} component of the first control command signal;
 - e) calculating a residual resulting from the application of the constrained k_{th} component;
 - f) generating a second control command signal in response to the residual; and
 - g) generating a compensating force as a function of the constrained k_{th} component and the second control command signal.
2. The method according to Claim 1, wherein said step d) further includes the steps of:

comparing components, including the k_{th} component, to a maximum threshold;
and
scaling the k_{th} component by a constant based upon the k_{th} component exceeding the maximum threshold.
3. The method according to Claim 2 further including the steps of:

generating the constrained k_{th} component $(u_{i,k})_{new}$ in said step d), where $(u_{i,k})_{new} = C u_{i,k}$ and $C = |(u_i)_k| / U_{max}$, and U_{max} is the maximum threshold;
calculating a change in the k_{th} component in the control command signals as a function of $\Delta u_{i,k} = (u_{i,k})_{new} - u_{i-1,k}$; and
calculating the residual as a function of:
$$(z_{i-1})_{new} = (z_{i-1}) + T \Delta u_{i,k}.$$

4. The method according to Claim 1, further comprising:
 - generating a controller weighting matrix;
 - generating a constrained control component ($W_{u,new,k}$) as a function of:

$$W_{u,\text{new } k,k} = W_{u,k,k} + A,$$

where A is a constant that greatly exceeds the magnitude of $W_{u,k,k}$.

5. The method according to Claim 4, further comprising:
 calculating a new command change ($\Delta u_{i,new}$) as a function of
 $\Delta u_{i,new} = D_{new} (W_{u,new} u_{i-1} + T^T W_z (Z_{i-1})_{new})$ and where:

$$D_{new} = -(T^T W_z T + W_{u,new} + W_{\Delta u})^{-1}$$

6. A method for actively controlling vibration including the steps of:
 - a. measuring ambient vibration;
 - b. generating a first command signal based upon said vibration measured in said step a;
 - c. constraining a first component of the first command signal;
 - d. determining a residual vibration resulting from the constraint of the first component;
 - e. generating a second command signal based upon said residual vibration.
7. The method of claim 6 further including the steps of:
 - f. activating a plurality of force generators based upon said constrained first component and said second command signal.
8. The method of claim 7 wherein said step c. further includes the step of comparing said first component of the first command signal to a maximum allowable command signal.
9. The method of claim 8 wherein said step c. further includes the step of reducing the first component to the maximum allowable command signal.

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10. An active control system comprising:

A plurality of sensors for measuring ambient vibration;

A control unit generating a first command signal based upon said vibration measured by said plurality of sensors, constraining a first component of the first command signal, determining a residual vibration resulting from the constraint of the first component and generating a second command signal based upon said residual vibration;

A plurality of force generators activated based upon said first command signal, said second command signal and said constrained first component.

11. The active control system of claim 10 wherein the control unit compares said first component of said first command signal to a maximum allowable command signal.

12. The active control system of claim 12 wherein the control unit reduces the first component to not exceed the maximum allowable command signal.

13. A computer readable medium storing a computer program, which when executed by a computer performs the steps of:

- a. generating a first command signal based upon measured vibration;
- b. constraining a first component of the first command signal;
- c. determining a residual vibration resulting from the constraint of the first component;
- d. generating a second command signal based upon said residual vibration.

14. The computer readable medium of claim 13 which when executed by a computer further performs the steps of:

- e. activating a plurality of force generators based upon said first command signal, said constrained first component and said second command signal.

15. The computer readable medium of claim 13 which when executed by a computer said step b. further includes the step of comparing said first component of the first command signal to a maximum allowable command signal.

16. The computer readable medium of claim 15 wherein said step c. further includes the step of reducing the first component to the maximum allowable command signal.

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